

STATEMENT Ref. no. O 13-2016
21-04-2017

Institution requesting the statement

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Background

In a letter received on 28 June 2016, Uppsala University has requested a statement from the Expert group on misconduct in research at the Central Ethical Review Board.

The letter refers to a concerns report of suspected misconduct in research from Fredrik Jutfelt, Josefin Sundin, Dominique Roche, Graham Raby, Ben Speers-Roesch, Sandra Binning and Timothy Clark directed at the postdoctoral research fellow Oona Lönnstedt, and Professor Peter Eklöv at the Department of Ecology and Genetics at Uppsala University. The challengers have requested that the Central Ethical Review Board's Expert Groups issue a statement.

The allegations of misconduct in research relate to a scientific article in the journal *Science*, *Environmentally relevant concentrations of microplastic particles influence larval fish ecology* (*Science* 2016 352: 1213-1216. doi: 10.1126/science.aad8828). The challengers allege essentially that data is missing, that the methods as described in the article are not those used in the study, that reported sample sizes etc. are not consistent and that there are considerable differences between what has been stated by the authors and what has been reported by eyewitnesses when the experiments were conducted.

In a preliminary investigation of the allegation of scientific misconduct conducted on 31 August 2016, Uppsala University found no evidence for scientific misconduct in the research conducted by Peter Eklöv and Oona Lönnstedt.

On 23 September 2016, the Expert Group appointed Professor Bertil Borg of Stockholm University as an expert in the case. On 23 February 2017, Bertil Borg produced a report. Peter Eklöv and Oona Lönnstedt submitted responses to the report.

The Expert Group has received additional documentation in the case from Uppsala University. The challengers of the article have continued to produce large volumes of

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additional material in the case. In response, the Expert Group has asked further questions concerning activity at the research station and these have been answered by Anders Nissling and Gunilla Rosenqvist. On 18 January 2017, Jerry Eriksson and Lars Gustafsson from the Expert Group, together with the expert Bertil Borg, visited Peter Eklöv and head Lars Tranvik at the Evolutionary Biology Centre at Uppsala University.

Bertil Borg believes that a number of circumstances in the case can be questioned, including the reporting of data to the journal, the lack of data, the research set-up and timeline, as well as a number of remaining question marks concerning the numbers of eggs and fry, and also water temperature. Bertil Borg also considers the lack of animal research ethics approval to be serious. Bertil Borg's conclusion is that the suspicions of misconduct cannot be dismissed.

The Expert Group's assessment

Peter Eklöv and Oona Lönnstedt have questioned Bertil Borg's impartiality and asserted that he has, in various respects, collaborated both with one of the challengers and with other individuals involved in the investigation. It is unavoidable in a relatively narrow field of research for individuals in that field to be acquainted. The Expert Group confirms that Bertil Borg's collaboration or other contacts with one of the individuals involved in the case does not by its nature provide sufficient cause to question his impartiality.

Peter Eklöv and Oona Lönnstedt have also asserted disqualification with respect to those providing information, being Anders Nissling and Gunilla Rosenqvist. The Expert Group confirms that these parties who provided information, only provided certain information in the case and that it was openly reported what relationship they have to the challengers and those accused in the case. This information should be assessed based on any connections those providing the information have with the parties involved in the case. The Expert Group finds in this case that nothing has come to light that gives cause to question the information provided.

The Expert Group notes initially that several questions were repeatedly put to Peter Eklöv and Oona Lönnstedt in order to resolve the question marks in this case. The answers received have been in all essentials deficient, at times contradictory and have not infrequently given rise to further questions. This is also the case with the information provided at the visit the Expert Group paid to Peter Eklöv and Lars Tranvik in Uppsala. The challengers have continued to produce large volumes of material, in part containing new allegations of scientific fraud, which has made investigation of the case difficult. The Expert Group has based its assessment on the original concerns report.

The scientific article in Science claims that the animal ethics committee had given its approval for the experiments in question. The statement concerning approval is not consistent with the truth. This statement has been repeated by Peter Eklöv and Oona Lönnstedt in their contacts with the Expert Group. Animal ethics approval was issued in this case for fish species other than those used in the experiments in question, and also for species from another watercourse. This approval was additionally issued after the experiments reported in the scientific article were supposedly started. By deliberately stating that animal ethics approval was in place, Peter Eklöv and Oona Lönnstedt have been guilty of scientific misconduct.

With regard to the lack of original data for the research, the Expert Group has the following assessment. Peter Eklöv and Oona Lönnstedt report that the lack of original data was due to the theft of a computer, but that most of this was stored on the University's databank. The claim that data was saved on the databank was made in the article. It was further stated that original data could be found in the supplementary material to the article. Despite repeated inquiries by the Expert Group about gaining access to this material, original data has not been provided. It is an absolute requirement that original data used in research is saved and kept available. There must therefore be some form of backing-up in case of e.g. disappearance of a computer. The fact that Peter Eklöv and Oona Lönnstedt produced no more than weak fragments of the original data and no original traceable data files, forming a basis for the research presented in the article, leads to suspicion that the research was not conducted, at least not to the reported extent. It is further questioned in the concerns report whether the research has been conducted to the reported extent, since there is a suspicion that Oona Lönnstedt was not present at the research station on Gotland to the extent that she reported. The Expert Group has requested support for Oona Lönnstedt's tasks, though this has not been provided. It can be questioned therefore whether the research continued throughout the period of time stated in the case. It may be considered particularly remarkable that the article was sent for publication without the presence of the necessary data. It is worth pointing out here that the journal Science was deficient in its checking in this respect. The Expert Group considers the deficiencies in terms of original data to be of such severity in a research ethics perspective, that Peter Eklöv and Oona Lönnstedt, by their inability to present original data for the research, have been guilty of scientific misconduct.

With regard then to Peter Eklöv's and Oona Lönnstedt's statements concerning the findings reported in the article, as well as how the research was conducted, a number of question marks can be raised. The Expert Group's task is to investigate whether the reported research involved misconduct, and not to comment on the quality of the research as such. In order to investigate the issue of misconduct, the Expert Group has however attempted to substantiate both the findings and the research where these have been questioned. It is accordingly stated in the article e.g. there were four bubblers per aquarium. The Expert Group has requested pictorial documentation, but the challenged authors failed to produce this. The article also reports significant hatching frequency/mortality in the eggs/fry groups that had been exposed to microplastic particles. According to the answer given to the Expert Group by Peter Eklöv and Oona Lönnstedt, there was no pre-treatment of the plastic particles, e.g. separation by centrifuging from the detergent-containing concentrated particle suspension. The Expert Group therefore believes that it cannot be ruled out that detergent from the particle suspension caused this effect. Microplastic particles are supplied in suspensions containing added detergent. In this type of experiment it is therefore necessary to separate the microplastic particles from the suspension, or else conduct control experiments using just the suspension. No such measure was reported, not even in response to direct questioning when the Expert Group visited the institution. If the experiments had been conducted in the way described by the authors, the interpretation of the entire series of experiments and of the work as a whole must be questioned due to the absence of adequate control experiments. According to the Expert Group's assessment, it is remarkable that the article, given these deficiencies, was accepted by the journal Science.

The article in Science contains further statements that have been questioned by the challengers, such as the size of the *Artemia nauplii*, the sizes of the beakers used in the experiments and how often the water was changed, etc. The Expert Group has also attempted

to bring some clarity to these issues. Despite Peter Eklöv and Oona Lönnstedt having been given several opportunities to explain these circumstances, the question marks remain. The absence of original data has made matters worse in this respect, as well as the fact that it was essentially a matter of one party's word against another's. This leads to the Expert Group's conclusion that it is unable to pronounce on these circumstances.

In view of the above, the Expert Group finds it remarkable that Uppsala University, in its preliminary investigation of 31 August 2016, found no support for the presence of misconduct in the research carried out by Peter Eklöv and Oona Lönnstedt.

In summary, and in accordance with what has been stated above, the Expert Group finds that Peter Eklöv and Oona Lönnstedt have been guilty of scientific misconduct. Despite Oona Lönnstedt having been, in practice, responsible for the larger part of the alleged research, this does not free Peter Eklöv of responsibility. Peter Eklöv, in his role as senior researcher, bore significant responsibility for what transpired. Peter Eklöv and Oona Lönnstedt therefore have shared responsibility for the alleged deficiencies.

In view of the lack of ethical approval, the essential absence of original data for the experiments reported in the article, and the widespread lack of clarity concerning how the experiments were conducted, it is the opinion of the Expert Group that the article in Science should be recalled.

Consideration of the case by the Expert Groups is accordingly complete.

This statement has been decided on by Lena Berke, chairperson, Lars E Gustafsson, Elisabeth Rachlew, Holger Luthman and Elin Wihlborg. Also present at the final consideration of the case were the deputies Jerry Eriksson, Ann-Charlotte Smedler, Christina Moberg, Ulrik Ringborg and Aleksander Giwercman, administrative director Jörgen Svidén and administrative secretary Eva Kaaman Modig.

For the Expert Group on misconduct in research

Lena Berke